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(54) METHODS FOR ADDRESSING ELECTROPHORETIC DISPLAYS

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This patent is subject to a terminal dis-

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- (51) Int. Cl.⁷ G09G 3/34

(56) References Cited

U.S. PATENT DOCUMENTS

3,036,388	A	5/1962	Tate	35/6
3,384,488	A	5/1968	Tulagin et al 9	6/88

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

DE 44 31 441 C1 2/1996 DE 195 00 694 A1 8/1996

(List continued on next page.)

OTHER PUBLICATIONS

Stephen F. Blazo, "10.1/9:00 A.M.: High Resolution Electrophoretic Display Photoconductor Addressing," SID 82 Digest, pp. 92–93.

Bohnke, et al., "Polymer–Based Solid Electrochemic Cell for Matrix–Addressable Display Devices," Journal of the Electrochemical Society, vol. 138, No. 12, Dec. 1991, pp. 3612–3617.

Chiang, et al., "11.5/4:10 P.M.: A High Speed Electrophoretic Matrix Display," SID 80 Digest, pp. 114–115.

(List continued on next page.)

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(57) ABSTRACT

Novel addressing schemes for controlling bistable electronically addressable displays include the use of addressing signals with additional signals having opposite polarity and equal integrated signal strength, and addressing schemes that minimize the number of state changes that a display element undergoes. In one embodiment, pre-pulses are employed to apply a pre-stress to an display element that is equal and opposite to the electrical stress applied in addressing the element. In another embodiment, the addressing signal is followed by a post-stressing pulse. Methods for minimizing the number of display elements that must change state to change the image displayed include the determination of a set of elements that must be deactivated and a set of elements that must be activated to change the image depicted by a display. Alternatively, only the elements forming one image are deactivated before the elements forming a different image are activated.

43 Claims, 14 Drawing Sheets

